GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Chemical reactors engineering , PG_00038529		
Field of study	Chemical Technology		
Date of commencement of studies	February 2024	Academic year of realisation of subject	2023/2024
Education level	second-cycle studies	Subject group	Obligatory subject group in the field of study
Mode of study	Full-time studies	Mode of delivery	at the university
Year of study	1	Language of instruction	Polish
Semester of study	1	ECTS credits	2.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Department of Chemical and Process Engineering -> Faculty of Chemistry		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Jacek Gębicki	
	Teachers	dr hab. inż. Jacek Gębicki	

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	15.0	15.0	0.0	0.0	0.0	30

E-learning hours included: 0.0

Learning activity and number of study hours

Learning activity	Participation in didactic classes included in study plan	Participation in consultation hours	Self-study	SUM
Number of study hours	30	5.0	15.0	50

Subject objectives

Present the students the basic concepts related to the design of chemical reactors. Familiarize students with the design equations for different types of reactors. Description of ideal and real reactors. Developed students' computational skills.

Learning outcomes

Course outcome	Subject outcome	Method of verification
K7_K01	The student recognizes the difference between the ideal and the real reactors. He can use this knowledge to optimize production.	[SK5] Assessment of ability to solve problems that arise in practice
K7_U03	The student knows how to perform basic calculations using knowledge of design equations for different types of reactors.	[SU1] Assessment of task fulfilment [SU4] Assessment of ability to use methods and tools

Subject contents

Equilibrium constant of chemical reaction, its dependence on temperature and pressure. Shift of the equilibrium state. The speed of chemical reactions for the periodic and flow processes. Dependence of reaction rate and value of equilibrium conversion degree vs temperature. Ideal batch reactor. Ideal flow reactor. Design equation of batch reactor for a single chemical reaction. The heat balance for a batch reactor with isothermal and adiabatic process. The isothermal and adiabatic process in the plug flow reactor (continuous tubular or tower reactor). A continuous stirred-tank reactor. Multiple continuous stirred-tank reactor cascade. Graphic design. Semi-batch reactor. Material balance equations. Functions of residence time distribution for the ideal and real reactors. The surface process of the contact reactions. Effect of temperature and pressure. External diffusion. Effect of changes in concentration and temperature on the overall rate of process. Chilton - Colburn J-factor analogy. Internal diffusion. Thiele module. Efficiency ratio of contact. Pseudohomogeneous and heterogeneous models of contact reactors.

Prerequisites and co-requisites

Understanding of the kinetics and equilibrium of chemical reactions and of mass and heat transfer. Knowledge of the subjects: Physical chemistry, Chemical Apparatus, Chemical Engineering.

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
two colloquia during the semester (33% of points from accounting exercises each)	60.0%	100.0%

Recommended reading

Basic literature

1. J. Szarawara, J. Skrzypek, A. Gawdzik: Podstawy inżynierii reaktorów chemicznych, WNT 1991. 2. A. Burghardt, Bartelmus G., Inżynieria reaktorów chemicznych, PWN 2001. 3. J. Szarawara, J. Piotrowski: Podstawy teoretyczne technologii chemicznej, WNT 2010.

	Supplementary literature	1. W. Broetz, Podstawy inżynierii reakcji chemicznych, WNT 1969. 2. R. Pohorecki, S. Wroński, Kinetyka i termodynamika procesów inżynierii chemicznej, WNT 1979. 3. S. Wroński, R. Pohorecki, J. Siwiński, Przykłady obliczeń z termodynamiki i kinetyki procesów inżynierii chemicznej, WNT 1979.
	eResources addresses	Adresy na platformie eNauczanie:
Example issues/ example questions/ tasks being completed		
Work placement	Not applicable	